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(54) IMPROVEMENTS IN OR RELATING TO SEPARATION DEVICES

(71) We, METALLWERK BIEBIGHAUSER KOMMANDITGESELLSCHAFT AUF AKTIEN, a German Kommanditgesellschaft of 14 Borsigstrasse, 5670 Opladen, Germany, do

hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to devices for the separation of oil from gaseous fluids containing an oil mist.

According to the present invention, there is provided a device for the separation of oil from gaseous fluids containing an oil mist, comprising a housing having an inlet at one end portion and an outlet at an opposite end portion, and turbulence-producing means comprising at least one baffle plate located in the housing, the housing being formed by two cup-like housing members one of said housing members including the inlet and the other of said housing members including the outlet and the said housing members having at their adjacent end portions, mutually parallel surfaces between which are held the edge portions of the or each baffle plate which extends across the width of the housing, the turbulence-producing means being operative to generate turbulence in the gaseous fluid flowing through the housing to thereby separate the oil therefrom, the said baffle plate or plates being the sole means in the housing for causing separation of the oil from the fluid.

Preferably, the turbulence-producing means comprises two baffle plates each formed with plane annular outer edge portions which are arranged in face-to-face relationship against each other and against the adjacent contact surfaces of the housing members, and one housing member has a diametrically enlarged end portion which fits over the end portion of the other housing member. Such an arrangement provides precise contact of the two plates, and also accurate location of the two plates with respect to each other and to the housing.

In one preferred embodiment, the enlarged end portion of the housing member is shaped to form a flange which encloses a traversely outwardly directed flange at the adjacent end portion of the other housing member. In this embodiment, the connection of the two housing members to each other and the fixing of the plates within the housing, is provided by means of a swaging operation. In another preferred embodiment, in which the said other housing member lacks an outwardly directed flange, the two housing members are connected by brazing or soldering.

To effect an improvement in the separation efficiency one of the plates is preferably formed with gas inlet slots and is located before the other plate, which is provided with outlet apertures, in the intended direction of flow of the gaseous fluid, and both plates have a dished portion to establish a turbulence chamber between the plates. With this arrangement, the pressure of the gaseous fluid traversing the device is reduced in the turbulence chamber, so that the oil mist contained in the gas precipitates in the form of oil droplets.

Advantageously, the first or upstream plate is provided with four punched-out U-shaped excisions to form the gas inlet slots, and with a plane baffle portion. This form of the baffle plate can be shaped in one action during the punching-out operation.

Preferably, the housing is arranged to be vertically positioned with one of the housing members located above the other housing member. A pipe, acting as a connector stub, is provided with a projection which is pressed out of the wall of the pipe at the

upper end portion thereof to act as a stop for determining the position of the pipe on the lower housing member and to leave in the wall of the pipe, a drain opening whereby separated oil can drain from the bottom of the lower housing member.

Embodiments of the invention, will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a side elevation, partially in section, of a first embodiment of an oil separation device in accordance with the invention;

Figure 2 is a cross-section through a downstream baffle plate of the device shown in Figure 1;

Figure 3 is a plan view of the downstream baffle plate;

Figure 4 is a cross-section through an upstream baffle plate of the device shown in Figure 1;

Figure 5 is a longitudinal section through a second embodiment of the device;

Figure 6 is a cross-section through a downstream baffle plate of the device shown in Figure 5;

Figure 7 is a plan view of the baffle plate shown in Figure 6;

Figure 8 is a cross-section through an upstream baffle plate of the device shown in Figure 5; and

Figure 9 is a plan view of the baffle plate shown in Figure 8.

Each of the separation devices shown in the drawings comprises a housing formed by a lower cup-like housing member 1 and an upper cup-like housing member 2, the housing members each having rotational symmetry about the longitudinal axis of the housing. The housing members 1 and 2 are of approximately the same diameter and have mutually parallel surfaces at or near their adjacent end faces. An upstream baffle plate 4 and a downstream baffle plate 5 are clamped between these surfaces. these plates act as turbulence producing elements.

In the embodiment shown in Figures 1 to 4, the lower housing member 1 is integrally formed with a tubular connector stub 1*a* and the upper housing member 2 has an opening 2*a* to permit the insertion of a discharge hose (not shown). The lower housing member 1 is provided at its upper end with an annular flange 1*b* extending outwardly at right angles to the axis of the housing, and which increases the annular contact surface area for the baffle plate 4. The flange 1*b* is enclosed within an enlarged end portion 2*b* of the upper housing member 2, the annular contact surface for the sieve plate 5 being increased by the end portion 2*b*. The baffle plates 4 and 5 are formed with plane annular outer rims 4*a* and 5*a*, respectively, to provide a relatively large contact area between the two plates 4 and 5 and between the plates and the corresponding surfaces of the housing members 1 and 2, respectively. The upper housing member 2 is secured to the lower housing member 1 by swaging-over the end portion 2*b* which simultaneously secures the plates 4 and 5 within the housing.

In the embodiment shown in Figures 5 to 9, the upper end of the lower housing member 1 is not provided with an annular flange; consequently, the enlargement of the end portion 2*b* of the upper housing member 2 is smaller than shown in Figure 1. Sufficiently large surfaces are nevertheless obtained for the outer rims 4*a* and 5*a*, respectively, of the baffle plate 4 and of the baffle plate 5, as will be apparent from Figure 5. Fastening of the upper housing member 2 to the lower housing member 1 is effected by swaging or by soldering or brazing, whereby the plates 4 and 5 are secured in position within the housing.

The lower housing member 1 is provided with a separate pipe 3, instead of an integral connector stub as shown in Figure 1, the pipe 3 having, at its upper end portion, a projection 3*a* pressed out of the wall of the pipe. The projection 3*a* acts as a stop for determining the position of the pipe 3 with respect to the lower housing member 1, and also leaves in the wall of the pipe a drain opening for separated oil which collects on the bottom of the lower housing member 1.

As shown in Figure 9, the baffle plate 4 is provided with four punched-out U-shaped excisions 4*b*. These punched-out excisions 4*b* form air inlet slots in a dished main portion of the baffle plate 4. A plane plate portion 4*c* is formed at the same time. The baffle plate 5 is provided with a plurality of holes 5*b*, the size and number of which are selected in accordance with the conditions which will exist within the housing. The baffle plate 5 is also provided with a dished portion. A turbulence chamber 6 is defined between the dished portions of the baffle plate 4 and the baffle plate 5, in which the pressure of the gaseous fluid passing through the housing is reduced. The separation of the oil present in the gaseous fluid in the form of oil mist is thereby improved.

To assemble the device described above, the baffle plate 5 and the baffle plate 4 are located in the enlarged end portion 2*b* of the upper housing member 2, and the lower housing member is then placed in position. Assembly is completed after the swaging-over of the enlarged end portion 2*b* or after the latter has been brazed or soldered to the lower housing member.

The production of the device particularly described is simplified by the use of two rotationally symmetrical cup-like housing members, which may be produced in a simple manner, to form the housing; the two baffle plates, which act as built-in turbulence producing elements, can be stamped out in a simple manner in the form of circular discs. The assembly operation of the device is simplified by the fact that these two plates are placed between the end faces of the housing members prior to joining the two housing members to each other, and are secured together with the housing members, so that a separate fastening operation for the plates is superfluous.

The separation device may be situated in a venting duct leading to the combustion space of an internal combustion engine of a motor vehicle, and the device may also be used in a hydraulic transmission system of a motor vehicle.

The separation device may be adapted in a simple manner to the prevailing conditions, since it is possible to change the size of the air inlet slots or outlet apertures of the baffle plates without varying the form and size of the two-piece housing and the method of installation of the device. The device may, for this reason, be adapted to different types and sizes of combustion engines for example, without any difficulties.

The device particularly described is of relatively simple construction, and requires a relatively small space; further, the device has a relatively high separation efficiency.

In the device described, the baffle plates, which produce the turbulence in the fluid, are the sole means in the housing for causing separation of the oil from the fluid. The device thus also contrasts with separators of the type in which means are provided for inducing a uniform helical or cyclonic flow (i.e. a non-turbulent flow) in the separator housing so as to cause separation of liquid from a gaseous flow through the housing.

WHAT WE CLAIM IS:—

1. A device for the separation of oil from gaseous fluids containing an oil mist, comprising a housing having an inlet at one end portion and an outlet at an opposite end portion, and turbulence-producing means comprising at least one baffle plate located in the housing, the housing being formed by two-cup like housing members one of said housing members including the inlet and the other of said housing members including the outlet and the said housing members having at their adjacent end portions mutually parallel surfaces between which are held the edge portions of the or each baffle plate which extends across the width of the housing, turbulence-producing means being operative to generate turbulence in the gaseous fluid flowing through the housing to thereby separate the oil therefrom, the said baffle plate or plates being the sole means in the housing for causing separation of the oil from the fluid.

2. A device according to claim 1, wherein the turbulence-producing means comprises two baffle plates each comprising a plane annular outer edge portion, the outer edge portions of the two plates being in face-to-face engagement with each other and with the adjacent surfaces of the housing members, and one housing member having a diametrically enlarged end portion which is disposed around the adjacent end portion of the other housing member.

3. A device according to claim 2, wherein the said end portion of the said one housing member is shaped to enclose an outwardly-directed annular flange projecting transversely from the said end portion of the other housing member.

4. A device according to claim 2 or claim 3, wherein one of the plates has gas inlet slots, the other of the plates has outlet apertures, the said one plate is located before the said other plate in the intended direction of flow of the gaseous fluid, and both plates are dished to form a turbulence chamber between said plates.

5. A device according to claim 4, wherein the said one baffle plate is provided with four punched-out U-shaped excisions to form the gas inlet slots and a plane plate portion.

6. A device according to any one of claims 1 to 5, wherein the housing is arranged to be generally vertically mounted such that one of the housing members is located above the other of the housing members, the inlet is provided at the lower end portion of the lower housing member, the outlet is arranged in the upper end portion of the upper housing member, and a pipe is located in the inlet, said pipe having a projection pressed out of the wall of the pipe at the upper end portion thereof to act as a stop for determining the position of the pipe relative to the lower housing member and to leave in the wall of the pipe an opening through which oil can drain from the bottom of the lower housing member.

7. A device according to any of claims

1 to 6, wherein the housing members each have rotational symmetry about the axis of the housing.

8. A separation device substantially as hereinbefore described with reference to the accompanying drawings.

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1505293 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig.1

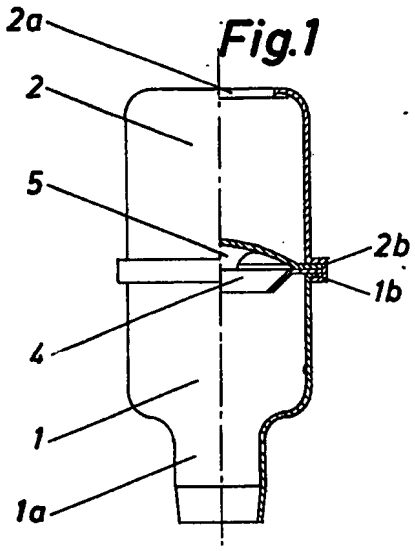
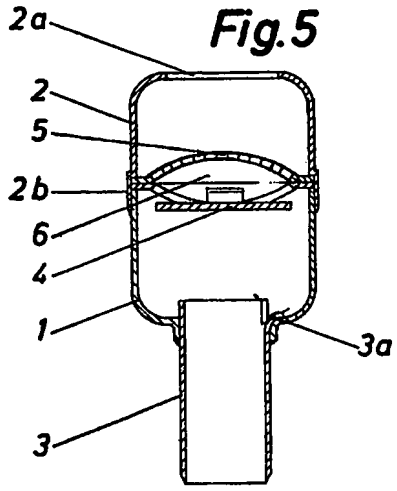


Fig.5



1505293 COMPLETE SPECIFICATION
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Sheet 2

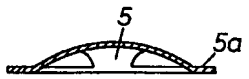

FIG.2.

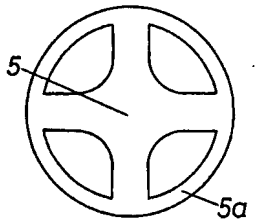

FIG.3.

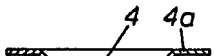

FIG.4.

FIG.6.

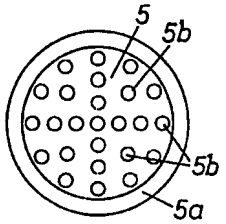

FIG.7.

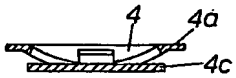

FIG.8.

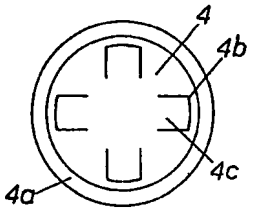

FIG.9.